Thermospheric Wind in the lower F-region

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Satellite GOCE observation of neutral wind near ~250 km altitude during 2010–2013 were examined near dawn and dusk. The analysis has revealed interesting new features on the spatial and seasonal variation of the quiet time *F* region wind. (1) The wind structure in equatorial regions is aligned with the dip equator in all seasons but June solstice, forming a strong eastward jet in the evening sector but a weak westward jet in the morning sector. This demonstrates a magnetic control of the thermospheric wind. (2) The equatorial evening eastward wind reaches over 120 m/s in December but drops below 90 m/s in June. This weak wind likely leads to the frequently observed weak prereversal enhancement in June. (3) At middle latitudes, winds experience a marked annual variation but with opposite phase between the evening and morning sectors. The evening eastward wind maximizes in local winter (~140 m/s) and minimizes in local summer (~60 m/s), while the morning westward wind behaves vice versa. This annual variation may be attributed to the Midlatitude Summer Night Anomaly. (4) Although HWM14 empirical wind model significantly improved over HWM07, neither captures the wind's alignment with the dip equator. This leads to large underestimation of zonal winds by over 50 m/s at low latitudes in the evening sector at all longitudes in all seasons. Care should thus be taken when using HWMs to drive physical models, as they likely produce weaker upward plasma drift.

Reference:

Liu, H., E. Doornbos, J. Namashima, Thermospheric wind observed by GOCE: wind jets and seasonal variations, *J. Geophys. Res.,* 121, 1-13, doi:10.1002/2016JA022938, 2016